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ABSTRACT

Tech Prep programs have been designed and structured to forge strong and comprehensive links between secondary and postsecondary education institutions. Programs within these institutions lead to completion of an associate degree or two-year certificate, provide technical preparation in specified fields, build student competence, and lead to placement in employment. Key concepts that were developed to address Tech Prep needs and concerns were provided for in the Carl D. Perkins Vocational and Applied Technology and Vocational Education Act of 1990. The configurations of programs and the articulation between institutions required to implement them will require evaluation to assure that Tech Prep fulfills its goals. An evaluation model is proposed that draws on the Context, Input, Process, and Product model of D. L. Stufflebeam. A national survey that yielded 35 replies provided a picture of Tech Prep in the states, a picture of considerable diversity. A pilot test focusing on interviewing Tech Prep coordinators in one state (Missouri) indicated that curriculum development is an area of particular concern. The Tech Prep concepts must be translated to programmatic forms, subject to evaluation and assessment. Multiple means of assessment will be critical to effective program evaluation. Eleven tables and one figure present analysis results. (Contains 20 references.) (SLD)

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Evolving a Model for Evaluating Tech Prep Implementation

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Running head: TECH PREP IMPLEMENTATION

Toward a Model For Assessing Tech Prep Implementation

Introduction

Today's educational structures are facing profound and exciting new challenges. Concern about the United States' ability to compete in world markets has focused attention to the link between education and employment. Increasingly complex technologies are rapidly extending into virtually every aspect of modern life. Students will need to acquire both an understanding of the subjects studied and the capacity to apply what they have learned in the increasingly complex real-world settings they will face as they enter the workforce. Educational systems are searching for ways to promote the integration, application and transfer of learning through mechanisms that are meaningful and motivational to students and that are capable of preparing them for living in an increasingly complex world. Government and educational agencies are responding to this call for reform. Federal and state initiatives have been developed to restructure education including Goals 2000, School-to-Work Opportunities Act, and Tech Prep.

Key concepts that were developed to address these needs and concerns were provided for in the Carl D. Perkins Vocational and Applied Technology and Vocational Education Act of 1990. Tech Prep programs have been designed and structured specifically to forge strong and comprehensive links between secondary and postsecondary educational institutions. Programs within these institutions lead to the completion of an associate degree or two-year certificate; provide technical preparation in a specified field; build student competence in mathematics, science and communications; and lead to placement in employment. Specific program goals set forth in the Act include the development of articulation agreements, a core of required courses, curriculum, in-service teacher and counselor training, equal access for special populations, and preparatory services.

Tech Prep programs include provisions for 2+2, 2+2+2, 4+2, and 4+2+2 configurations. Within these configurations, articulation agreements are developed and implemented between the educational agencies involved. Articulation links two or more educational agencies and enables students to move from one level to the next without delay or duplication of courses. Tech Prep programs also provide secondary students the opportunity to enter directly into the workplace. This is done by developing applied academic and technical course work for students at the secondary level.

Thus it is clear that Tech Prep is comprehensive and ambitious in terms of both goals and scope. There is tremendous potential for spanning the boundaries between vocational and academic education, and making education more efficient and meaningful for students.

But critical questions must be asked, "How are we to know if Tech Prep is fulfilling its promise? What are the essential criteria that should be used to assess Tech Prep outcomes? What evidence is there to suggest that Tech Prep is making a difference?"

The Tech Prep initiative is emerging from its infancy. Its mission and vision are taking root in concrete form through programs, initiatives, articulation agreements, applied academic courses, and much more. It is becoming increasingly apparent that the time is right to initiate the process of assessing program effects. This is critically important at this juncture to: (a) determine specific program evaluation components of Tech Prep, and (b) to assess the extent to which local Tech Prep implementation efforts are consistent with the mandates of the Vocational Education Act.

Review of the Literature

Program evaluation is necessary to determine if Tech Prep is fulfilling the initial program goals. Program evaluation has been defined as "the application of systematic research methods to the assessment of program design, implementation, and effectiveness" (Chelimsky, 1985, p. 7). Of course the ultimate structure and value of program evaluation must be judged in terms of its ability to assess the pertinent characteristics or dimensions and to result in eventual program improvement.

Tech Prep Program Evaluation

Tech Prep programs should be evaluated to determine if the goals of the program have been attained. Numerous studies have been conducted over the past four years to assess Tech Prep programs (Bragg, Layton, & Hammons, 1994a; Brawer & Hammons, 1993; Delaware Statewide, 1990; Roegge, Wentling, Leach, & Brown, 1993; Rubin, 1993). While these studies vary in their overall purpose, each was aimed at describing the planning and implementation of local Tech Prep programs.

The basic purposes of Tech Prep program evaluation have been identified as collecting data, providing valuable information to stakeholders, and fulfilling the legislative requirements of the state's accountability system (Domsife, 1992). The Department of Education and Office of Vocational and Adult Education have provided guidelines for evaluating Tech Prep programs. These guidelines include identifying program characteristics and expected outcomes, anticipating possible outcomes and decisions that may result from the evaluation, identifying information sources, and summarizing and presenting the information (Brustein, 1993).

Increased emphasis was placed on evaluation, planning, and accountability as part of the amended 1976 Vocational Education Act. At the same time, vocational education program evaluation has been a neglected area of research with noted deficiencies in the process (Strickland & Asche, 1987; Wadsdyke, 1978). These deficiencies have included: (a) identifying indicators of the effectiveness of the program, (b) lack of follow-up as to the impact of vocational education programs, and (c) failure to use evaluation as part of program planning, policy setting, and review.

Hoachlander (1991) stated that the new Perkins Act would require the development and implementation of accountability systems that would document the progress of vocational education students and programs. He listed outcome indicators appropriate for accountability to include student achievement test scores, program completion rates, competency gains, and job placement rates.

Following a study by Bragg, Layton, and Hammons (1994b) it was recommended that evaluation of Tech Prep programs be conducted to ensure the continued federal support of the Tech Prep initiatives. In addition, seventeen student outcomes were identified incorporating academic skill attainment, employability skill attainment, and matriculation from high school to college.

Outcome Indicators

Limited research has been conducted to identify specific outcome indicators for Tech Prep programs. An outcome indicator is used to determine the program quality, effectiveness, and goal attainment. A summary of four studies conducted to identify outcome indicators for Tech Prep programs is provided in Table 1.

Table 1

Outcome Indicators for Tech Prep Programs

Author(s)	Purpose of Study	Outcome Indicators
Domsife	To establish baseline records, establish outcomes, and modify Tech Prep Programs. Identify focus component areas and group the performance indicators to determine the level of performance.	Percent of course enrollment Program competition Job placement Number of articulated classes Number of articulation agreements Marketing activities Staff development Advisement of students Student tracking
Hammons	Identify focus component areas and group the performance indicators to determine the level of performance.	Student retention Grade point average Demonstration of job competency Faculty professional development Guidance programs Access to special populations Academic and vocational skill attainment Level of satisfaction with the program Job Placement Employment levels Earning levels Quality and quantity of resources
Bragg & Layton	Determine the status of Tech Prep planning and implementation in the fifty states and District of Columbia.	Academic skills Secondary program completion rate Job placement rate Technical skills Postsecondary program completion rate Career awareness Employer satisfaction Problem-solving and critical thinking skills Attitudes toward or perceptions of technical careers Student self-esteem
Roegge, Wentling, Leach, & Brown	To develop a conceptual framework for Tech Prep based on the perceptions of personnel involved in planning and implementation of local Tech Prep programs.	Benefits Populations served Outcomes Program components Enrollment incentives External involvement Planning and support Staff development Articulation and integration

Domsife (1992) identified the outcome indicators that postsecondary institutions would collect for program accountability. Those indicators include percentage of course enrollment, program completion, job placement, number of articulated classes and agreements, marketing activities, staff development, advising, and student tracking.

Hammons (1992) identified six focus areas or components into which outcome indicators could be grouped. The "student" focus component indicators include student retention, grade point average, and demonstration of job competency. The "facilitator" focus component includes faculty professional development, guidance programs, and access to special populations. The "professional development" focus component relates to obtaining information related to academic and vocational skills attainment and advanced courses taken. The "attitudes/perceptions" focus component includes recognition and level of satisfaction with the program. The "careers" focus component evaluates job placement, employment levels, and earning levels. The final focus component, "resources," identifies the quality and quantity of resources utilized.

A study conducted by Bragg and Layton (1992) collected data related to Tech Prep philosophies and policies, staffing, administrative structure, evaluation, marketing, and staff development. A list of outcomes was presented to the respondents to ascertain if the outcomes had been included in their state's list of outcomes. These outcomes included improved: (a) academic skills, (b) secondary program completion rate, (c) job placement rate, (d) technical skills, (e) postsecondary program completion rate, (f) career awareness, (g) employer satisfaction, (h) problem-solving and critical thinking skills, (i) attitudes toward or perceptions of technical careers, and (j) student self-esteem. It was reported by Bragg and Layton that "since fewer than forty percent of the states have established outcomes at the state level, a major concern for all leaders at all levels should be the identification of expected outcomes and evaluation procedures" (p. 4-17).

A recent study by Roegge, Wentling, Leach, and Brown (1993) found that using the concept mapping process assisted with displaying the major components for Tech Prep programs. They identified the relationships between the components and priorities placed on each component and cluster of related components. The concept mapping process provided a pictorial representation of Tech Prep stakeholder's perceptions. Clusters identified included benefits, populations served, outcomes, program components, enrollment incentives, external involvement, planning and support, staff development, and articulation/ integration.

Evaluation Models

Several evaluation theorists have proposed varying types of evaluation models that can be considered for use or modification to assess Tech Prep. Regardless of the type of evaluation used, each produces knowledge that was not previously available. House (1983) has distinguished between the various models based on the various assumptions brought to the process.

Scrivens' (1983) Goal-Free model is primarily concerned with reducing the effects of bias in evaluations. The purpose is to establish and justify the merit or worth of a program. The Transaction model proposed by Stake (1983) concentrates on the educational process. This model utilizes various methods of inquiry to determine what the program looks like to different people. Stufflebeam's (1983) CIPP (Context, Input, Process, Product) model evaluates whether the program is effective, and if so, what program components are effective. Its overall purpose is to provide relevant information to decision-makers.

Stufflebeam's model views evaluation as a tool to help make programs work better for the people they are intended to serve. "The CIPP model is based on the view that the most important purpose of evaluation is not to prove but to improve" (Stufflebeam, 1983, p. 118). Identification of outcome indicators will assist in determining a program's overall quality, effectiveness and if the goals were attained. However, inherent in Stufflebeam's model is the notion that these "more ultimate" outcome characteristics are a function of a complex configuration of context, inputs, and process.

Stufflebeam's model involves four important and interactive dimensions - Context, Input, Process, and Product. Context evaluation, as the term implies, focuses on factors comprising the larger "environment" of a program (including community and institutional values, key constituencies, other reforms and change agents, etc.). Context assessment is designed to identify and explore these aspects with particular concern for how those contextual factors influence and intereact with the more "program specific" aspects of an implementation initiative. The decisions to be addressed by context evaluation include "deciding upon the setting to be served, the general goals to be sought, and the specific objectives to be achieved" (Worthen & Sanders, 1973, p. 136). The results of context evaluation should provide a sound basis for adjusting an initiative's existing goals and priorities and targeting needed changes.

Input evaluation focuses specifically on the resources which are injected into and directed toward an effert. It is designed to assess the degree to which those resources are appropriate and adequate as well as how they drive and fuel the process, and ultimately deliver the desired outcomes. According to Worthen and Sanders (1973) "methods for input evaluation are lacking in education" (p. 137). Input evaluation provides information for achieving program goals, what strategy to employ, and what design or procedural plan should be employed for implementing the selected strategy. Input evaluation seeks to address the Tech Prep program goals involving: (a) articulation agreements, (b) core of required courses, (c) curriculum development, (d) inservice teacher training, (e) in-service counselor training, (f) access special populations, and (g) preparatory services.

The process component is at the heart of any program's delivery system. It includes the mechanisms and structures that are specifically designed to translate the input resources into desired outcomes. The main use of process evaluation is to obtain feedback to assist decision-makers in carrying out the program plans or to modify the processes as needed. A series of data collection activities is critical with process evaluation. Process evaluation provides the decision-makers with information needed for anticipating and overcoming difficulties, making decision, and interpreting program outcomes.

Product evaluation is designed to focus the question of the degree to which a program's structure, given a certain "context" and "inputs" has successfully delivered on the program goals. The data collected ideally come from a variety of sources and individuals and should be evaluated to judge the success or failure of the program component in meeting the program goals. Reporting of product evaluation may occur at various stages of the Tech Prep program. Product evaluation is an essential component of the accountability report and provides significant data when seeking additional funding.

A Proposed Model

The literature contains several studies conducted to identify outcomes for conducting a program evaluation. No model was found that specifically identified Tech Prep program components and outcomes. Due to the comprehensive scope and

systemic nature of the Tech Prep concept, Stufflebeam's CIPP model (Context, Input, Process, and Product) was selected and adapted for evaluating Tech Prep programs (see Figure 1).

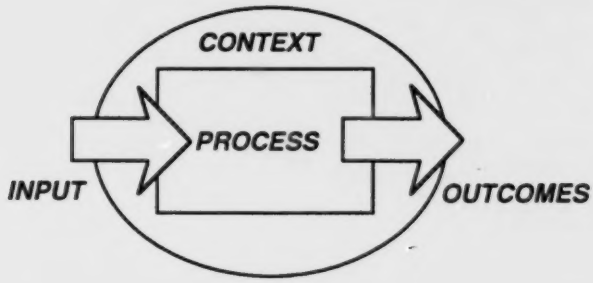

Figure 1. Modified CIPP Model for Assessing Tech Prep Implementation

While the Stufflebeam program evaluation model is inherently comprehensive and well suited for dynamic and systemic programs, additional information specific to each of the four major dimensions must be identified. This information is presented in Table 2.

The assessment model designed for evaluating Tech Prep programs includes Context, Input, Process and Outcomes. The context is framed by the federal and state initiatives to improve education that includes Goals 2000, School-to-Work Opportunities Act, and Carl D. Perkins reauthorization. As part of the Carl D. Perkins Vocational and Applied Technology Act of 1990, Tech Prep is viewed as a concept versus a program. Several states have passed legislation related to other school reform issues. Also included as a part of context is the stage of Tech Prep implementation. Dornsife (1992) has specified these as beginning, intermediate or advanced stages.

Inputs to the Tech Prep assessment model may include state or local consortium specific information to include but not limited to objectives for Tech Prep implementation, administrative structure, and funding. In addition, asking the question "who is the Tech Prep student" becomes part of the program planning and decision making process. These elements include: (a) articulation, (b) faculty and professional development, (c) curriculum development, (d) marketing efforts, and (e) guidance and counseling services.

The process involves gathering information from advisory committees, teachers, committee and professional meetings, cooperating schools within the Tech Prep consortium, integrated teams, recruitment materials, and career clusters. The outcomes are the specific indicators obtained to determine the Tech Prep's overall quality and if goals were attained.

Table 2

Tech Prep Components for each Program Assessment Dimension

Context Components
• Tech Prep as a "concept" instead of a "program"
• Federal and state initiatives to improve education (Goals 2000, School-to-Work, Perkins and Perkins reauthorization)
• Oregon, Kentucky, Wisconsin, Missouri and other states have passed legislation related to school reform.
• Continued thrust for accountability and restructuring education
• Coalitions for restructuring (SREB, Coalition of Essential Schools, National Alliance for Restructuring)
• Stage of implementation (beginning, intermediate, or advanced)

Input Components
Unit (state or local)
• Objectives for Tech Prep implementation
• Administrative structure
• Funding
• Community attitudes and resources
• School system attitudes, resources, and expertise
Student identification (who is a Tech Prep student?)
Program Element Inputs
• Articulation experience
• Faculty professional development structures
• Existing curriculum
• Marketing mechanisms
• Guidance procedures and staffing

Process Components
Advisory council interaction and input
Teacher team interactions (integration and planning)
Meetings related to Tech Prep implementation (teachers, counselors, administration, employers, parents, students, etc.)
Cooperating school agreements and interaction
Budget processes
Curriculum development
Integration process teams
Career path selection and development

Table 2 Continued

Tech Prep Components for each Program Assessment Dimension

Outcome Components
Percent of course enrollment
Program completion - secondary
Program completion - postsecondary
Secondary enrollment postsecondary (career path) program
Secondary completed postsecondary (career path) program
Job placement rate
Earning levels
Employer satisfaction
Number of articulated classes
Number of articulation agreements
Marketing activities
Advisement of students
Career development activities
Career clusters/pathways
Access to special populations
Student retention
Grade point average
Demonstration of job competency
Degree of satisfaction with the program
Academic skill attainment
Vocational skill attainment
Problem-solving and critical thinking skills
Attitudes toward or perceptions of technical careers
Student self-esteem

Purpose of the Study

Three years into the development of Tech Prep programs, there is a need to describe the current evaluation efforts of Tech Prep and the overall progress of the initiatives. The primary purpose of this study was to develop a program assessment model for evaluating Tech Prep programs. To accomplish this, the following objectives were formulated:

1. To identify existing program evaluation models that support Tech Prep evaluation.
2. To determine the evaluation criteria to include when evaluating Tech Prep programs.
3. To determine the program components to include when evaluating Tech Prep programs.
4. To determine the outcome indicators to include when evaluating Tech Prep programs.
5. To identify the processes used to collect evaluation information.

Methodology

Two primary approaches were used to explore the usefulness of the model that was evolved from the review of the literature. The first approach was to conduct a national survey of those responsible for statewide Tech Prep leadership and reporting. The purpose of the survey was to gather data along the four dimensions of the proposed assessment model (Context, Input, Process and Outcomes). More specifically, information was necessary to (a) assess the availability of data and (b) to further explore the feasibility, features, and robustness of the model. This information was also deemed essential because it impacts the potential utility of an assessment model. The data that were collected during this phase are presented in the "National Survey Finding" section.

The second approach that was used in the study was to pilot test a structured interview instrument that was developed to explore the process aspects of Tech Prep implementation. During this phase, the focus shifted to the process component of the model (specifically examining areas such as articulation procedures, staff development, marketing efforts, etc.) The pilot test was conducted with a consensus sample consisting of all Tech Prep coordinators (12) in one state, Missouri. These coordinators were interviewed, the results were recorded and then synthesized by assessment category. The results of this synthesis are presented in the "Pilot Test Interview Findings" section.

Program Outcomes Assessment - National Survey Findings

To obtain information about the nature of criteria used for the assessment of Tech Prep implementation efforts across the nation, State Tech Prep Coordinators (including Washington, DC and Puerto Rico) were contacted by mail and asked to complete a survey. The coordinators were also asked for information concentrating on the criteria and procedures used to conduct their statewide Tech Prep assessment procedures as well as for information on how Tech Prep students are identified. The initial mailing yielded 15 returns (28.8%). A follow-up survey including a second copy of the instrument was mailed to non-respondents approximately one month after the initial return deadline. This yielded an additional 20 returns for a total of 35 (see Table 3).

Table 3

Survey Response Rate

	Number of Returns	Return Percentage
Initial Return	15	28.8%
Returns from Second Mailing	20	38.5%
Total Returns	35	67.3%

The survey began by requesting information regarding the general structure of each of the state's Tech Prep program assessment procedures. Specifically, the respondents were asked whether their state "currently has an evaluation plan in place to evaluate [their] Tech Prep efforts?" Over three-fourths of those responding indicated that such a plan is in place (see Table 4).

Table 4

State Plan to Evaluate Tech Prep

	Frequency	Percentage
Have an evaluation program in place	27	77.1%
Do not have a program in place	7	20.0%
The program is in draft form	0	0.0%
No response	1	2.9%

N = 35

To probe the nature of the state evaluation plans, respondents were also asked to indicate which components of the Tech Prep program are included in their state's assessment procedures. Six components were listed on the survey (see Table 5). The responses indicate a pattern of assessment across multiple components rather than focused on any single dimension. Respondents were also encouraged to list any additional components that may be included in their state's evaluation plan. The limited responses were restricted to two components, i.e., business and industry involvement/apprenticeship opportunities and administration and organization.

Table 5

Components of Tech Prep Evaluation

	Frequency	Percentage
Articulation	22	63%
Student Program Planning	15	43%
Staff Development	21	60%
Curriculum	18	51%
Marketing	16	46%
Evaluation	15	43%
Other	5	14.3%

N=35

The focus then shifted to one of the key input elements in the assessment model that is being proposed in this study; the ability to determine the degree to which Tech Prep programs affect students along several dimensions including achievement, drop out, placement, etc. To assess this aspect of Tech Prep implementation, it would be extremely useful to be able to identify and distinguish between students who are in Tech Prep from those students who are not. Thus, the initial question on the survey asked

whether the state's consortia "can identify who is and who is not a Tech Prep student." Approximately two-thirds of the state coordinators who responded to the survey indicated that their state was able to identify a Tech Prep student (see Table 6).

Table 6

Ability to Identify Tech Prep Students

	Frequency	Percentage
Can identify Tech Prep students	24	68.6%
Cannot identify Tech Prep students	10	28.6%
No Response	1	2.8%

N = 35

In order to explore these responses in more depth, those who indicated an ability to identify Tech Prep students were then asked to indicate specifically "how" those students were identified in their state. The most frequent and most formalized responses indicated that Tech Prep students were those who are enrolled in courses:

(a) generally oriented toward an occupational path or career direction, or

(b) sequenced and articulated toward post-secondary technical training and/or certification. (These types of responses typically identified the articulation of math, science, communications, and technologically oriented courses.)

These types of rather formalized and consistent responses were provided by less than one-half (10-11) of those who had indicated that they are able to identify Tech Prep students. Additionally, these types of responses were typically accompanied by specific, statewide documentation that usually contained a definition of Tech Prep students.

Input from the remaining 50% of the sample who had responded favorably to the Tech Prep student identification question were more diverse and much less specific. In some cases, supporting documentation defined Tech Prep "programs" rather than Tech Prep "students." Others indicated that identification was either on a student self selected basis or that individual schools were free to designate based on their own criteria.

In the aggregate, the survey indicates considerable disparity across the nation in terms of the degree of formal identification of students participating in Tech Prep programs. Less than one half of those responding (or approximately one state in five) appear to have formalized and clearly documented a mechanism for identifying Tech Prep students. The results also indicate that many states either (a) do not have a mechanism for identifying these students or (b) are not using specific definitions or criteria to identify Tech Prep students.

As a follow-up to those who had indicated that they were not able to identify specific Tech Prep students, respondents were asked whether they "intend to include student progress as part of evaluation" and if so, how they plan to accomplish the assessment. One half of the respondents indicated that they plan to do so (see Table 7).

Table 7

Tech Prep Student Non-identifiers Intending to Use Student Progress in Program Evaluation

	Frequency	Percentage
Intend to use student progress as part of the program evaluation	5	50.0%
Do not Intend to use student progress as part of the program evaluation	2	20.0%
No Response	3	30.0%

N = 10

The responses of those indicating that they plan to use student progress information in spite of a lack of identification of Tech Prep students were examined for substance and patterns. The responses were quite non-specific in nature, referring generally to such strategies as "visiting with students," "performance base instruction," "performance reports," and "placement exams." None of the respondents indicated the mechanism by which students would be selected to participate.

Next, the focus shifted from general assessment planning to the criteria used to assess Tech Prep student progress. From a program assessment point of view, this poses a dilemma. Criterion based assessment of student progress presumes an ability to identify and track changes in students along the identified criteria. As has been indicated above, it is apparent that many states lack a mechanism for identifying Tech Prep students. Thus, the application of criterion referenced assessment procedures to individual students is not possible in these states. In the absence of procedures for identifying program participants, the same criteria may be applied generally across a selected sample of students (an entire school, a school system, certain grade levels, etc.). In this instance, however, the ability of assessment procedures to attribute changes in students (along the selected criteria) to the intervention of the program (in this case Tech Prep) is extremely limited.

In light of this important caveat, the results of those who indicated a lack of procedures for identifying specific Tech Prep students were examined (N=10). Six of the "non-identification" respondents indicated that they are using some of the criteria for evaluating student progress. The criteria that are being applied in these states were distributed across the range of assessment criteria (see Table 8). A similar pattern was observed for states indicating an ability to identify Tech Prep students. However, in addition to the use of multiple assessment criteria, respondents from these "identifyer" states also indicate that they are employing specific criteria to assess student progress at a higher percentage. In addition to the criteria that were provided on the survey, some additional criteria were suggested including graduation from college and adherence to a career plan.

Table 8

Evaluation Criteria Used to Assess Tech Prep Student Progress

	Specific Tech Prep Students Not Identified		Specific Tech Prep Students Identified	
	Frequency of "non identifiers"	Percentage of "non identifiers"	Frequency of "identifiers"	Percentage of "identifiers"
Drop out rate	3	30%	16	64%
Graduation rate	3	30%	18	72%
Test scores	1	10%	15	60%
Pursue post-secondary education	4	40%	19	76%
Job placement	2	20%	19	76%
Grades	0	0%	12	48%
Other	1	10%	5	25%

N for states indicating a lack of procedures for identifying specific Tech Prep students = 10

N for states indicating procedures for identifying specific Tech Prep students = 25

Total N = 35

It is important to note that a pattern of using multiple criteria to assess students was clearly present across the entire sample (see Table 9). Nearly 70% indicated that they are using more than one criterion and almost one half are using as many as five criteria. This use of multiple criteria provides a means of triangulating results that is an important feature of the proposed program assessment model.

Table 9

Multiple Criteria Used to Assess Tech Prep Student Progress

Number of Criteria Used	Frequency	Percentage
7	7	20.0%
6	6	17.1%
5	4	11.5%
4	2	5.7%
3	3	8.6%
2	2	5.7%
1	6	17.1%
0	5	14.3%

N=35

One of the important aspects of any assessment model or procedure has to do with the methods and instruments that are employed to gather data. This study found that on site interviews are the method of choice for Tech Prep program assessment data collection. Substantial use was also made of surveys, telephone interviews, and third party evaluators (see Table 10).

Table 10

Data Gathering Mechanisms

	Frequency	Percentage
On site Interviews	22	63%
Surveys	13	37%
Telephone Interviews	10	29%
Third Party Evaluation	12	34%
Other	20	57%

N=35

As was the case with student assessment criteria, there is a clear preference for using multiple procedures for gathering program assessment data. Over one half of those responding indicated that they are using multiple data collection procedures and one-third are using three or more. Again, this indicates a clear preference for triangulation rather than depending on a single mechanism (see Table 11).

Table 11

Use of Multiple Methods for Data Collection

Number of Methods Used	Frequency	Percentage
5	2	5.7%
4	7	20.0%
3	3	8.6%
2	8	22.8%
1	14	40.0%
0	1	2.9%

N=35

Program Process Assessment - Pilot Test Interview Findings

The previous section described a data collection procedure that was designed to focus the feasibility, nature, and usefulness of the proposed assessment model. The focus now shifts to a set of structured interviews that were conducted to explore the contextual input and process components of the model. To explore these aspects of the model, a structured interview pilot testing process was developed and used to explore the processes that are being used to implement Tech Prep. The process oriented categories that were explored were adapted from those developed by Dutton (1993). These categories included: (a) articulation and collaboration, (b) student program planning and implementation, (c) staff development, (d) curriculum development, and (e) marketing efforts.

The pilot test was conducted on a consensus sample consisting of all Tech Prep coordinators (12) in one state, Missouri. This section is designed to provide a brief synthesis of the findings obtained from this phase of the study as well as some additional, general observations and patterns that emerged through the interviewing process.

Articulation and Collaboration. This component examined articulation structures (e.g., 2 + 2, 2 + 2 + 2, etc.) as well as mechanisms used to facilitate collaboration with business and industry, counselors, vocational, and academic faculty. The findings indicated that these structures are in the initial stages of development. Various configurations of vocational and academic educators, counselors, administrators, and parents have been attending workshops designed to provide information and to establish working articulation agreements. The general level of interest in and support of the Tech Prep concept has been quite high. The most frequently reported challenges to the development of these alliances and agreements had to do with (a) changing attitudes (of academic teachers, administrators, counselors, etc.), and (b) the mechanics of articulating between programs with non-parallel curriculums, for example a secondary level residential wiring program with a post-secondary electronics program.

Student Program Planning and Implementation. This section focused on the program planning and structuring processes. While planning is in the initial stages,

clearly the most frequently used approach is the use of the career clusters. The most frequently identified clusters were agriculture, business and office, marketing, engineering technology, health and human services, and mechanical and industrial trades. The majority of the consortia indicate that their base line 2 + 2 programs will be grounded in career cluster curriculum structures that are beginning as early as grade 8.

Staff Development. The staff development component focuses on whether there was a plan that outlined and provided staff development activities for all Tech Prep facilitators, including administrators, counselors, and academic and vocational faculty. Specific types of staff development activities that were provided during the past calendar year as well as possible activities planned for the upcoming year were identified. The most frequently used mechanisms consisted of workshops, informational meetings, Tech Prep conference attendance, and on site visits. The sense that was conveyed through the conversations was that many of these interactions are at the preliminary information dissemination stage, designed to provide general orientation rather than in-depth training.

Curriculum Development. This focus component was designed to assess the degree to which vocational and academic teachers are working together to coordinate and integrate academic and occupational education. In what ways have faculty integrated the mathematics, science, communications, and technology competencies into their curriculum to support the workplace readiness skills? Tech Prep consortium directors were asked if any career clusters have been developed thus far to assist students in completing a four-year educational plan.

Three general observations can be made based on the interviews. First some concern was expressed over limited budgets to purchase curriculum materials. This was particularly significant since most of the consortia also indicated that they are using commercially developed curriculum (CORD, AIT, and PACE). A second thread was that applied academics tended to be a stand-alone course for mathematics, whereas language arts, physics, and biology units tended to be integrated or infused into other academic courses. Finally, most coordinators indicated that they are promoting and using team teaching as a mechanism for delivering integrated academic content and activities.

Marketing Efforts. A marketing focus category was included to identify the methods that are being used to promote the 2 + 2 Tech Prep concept, articulation, and the sequence of courses chosen within a vocational interest including the work in math, science, communications, and technology. The interview also focused on the overall perception of businesses, parents, students and education facilitators regarding the promotion and marketing efforts utilized thus far? Respondents were also asked to identify the methods that are being used by counselors to enroll students in Tech Prep. An important corollary purpose had to do with the degree to which counselors have an understanding of Tech Prep.

The findings indicated that a variety of tools and techniques are being employed for the general purposes of informing the public at large as well as to recruit students and educate public school personnel. These tools include the dissemination of information packets, posters, folders, videos, mugs, notepads, plaques, etc. Feedback indicated that while there has been considerable activity in this area, that it is too early to assess adequately the effectiveness of the promotional efforts, specially related to specific target audiences.

Summary Observations. The discussion will now turn to a general summary of impressions obtained throughout the interviewing process. There was a clear sense

across all the interviews that the Tech Prep initiative is promoting systemic change. This was communicated through two different types of perspectives. First, there was a strong sense of association with the broader range of educational reform that is occurring in Missouri (where major legislative action has spawned reform) and across the nation (Goals 2000, SCANS, etc.). Simply put, most see Tech Prep as a component in the larger context of educational reform. The second perspective related to systemic change was more local; namely that Tech Prep is leading to some fundamental rethinking of and restructuring of their local educational systems. Specific comments in this regard focused on changing configurations in how academic and vocational teachers interact, developing structures for increased integration and applications of academic content, elimination of the general track, changing the attitudes of parents, counselors, administrators, etc., toward the purpose of schooling and how content is delivered. Bottom line, there was a strong sense that their Tech Prep involvement is part of a larger, systemic educational reform movement.

A second general observation had to do with curriculum development. The sense that emerged from the interviews was that this is an area that needs serious attention. Across the consortia, the clear tendency has been to latch on to existing materials rather than to develop and customize materials at the local level. While many of these materials are of excellent quality, they, in many instances, fail to address the unique directions and configurations that are evolving out of the state's new curriculum standards and curriculum frameworks. Also, some of the materials have been better received by vocational teachers than by traditional academic teachers. The strong sense was that additional work needs to be invested in assisting teachers in the process of learning how to collaborate successfully with one another in the curriculum development and integration processes.

A final observation concerns the identification of Tech Prep students. This thread ran throughout the categories that were identified for analysis. For example, it was felt that marketing efforts would be greatly enhanced if the "target" was more clearly identified. If, on the other hand, Tech Prep is perceived as a kind of general program philosophy that somehow affects the entire school system (as opposed to specific students in specific ways within the system), then marketing is much more difficult. In short, it is one thing to market a general philosophy or structural change. It is quite another thing to recruit specific, individual students into classes that have been designated as part of Tech Prep. The same concern was raised when the conversation turned to program and student assessment as well as, to some degree, curriculum development. Coordinators were somewhat perplexed as to how procedures would be developed to align curriculum and then assess outcomes in the absence of specifically identified Tech Prep students. The overall sense was that Tech Prep student identification may be a critical key to forcing more general systemic change.

Discussion

Given the complex and multi-dimensional nature of the Tech Prep initiative, it is critical that a program assessment model be developed which is also multi-dimensional and capable of assessing systemic change. Within vocational education, there is a long history of focusing primarily on outcomes. Certainly this emphasis must be retained within any viable assessment model. Some of the outcomes are specific to the legislation such as including reduction of drop out rates, successful articulation of students into post-secondary level technical programs, etc. Still others are more specific to individual state and local settings. These program outcomes must be specified in advance if program effect is to be effectively assessed.

It should also be clear that successful Tech Prep assessment must involve more than the assessment of outcomes. Tech Prep outcomes are also a function of certain contextual, input, and process components. The most concrete example of this point from this study is that an absence of specific Tech Prep student identification (an input variable) leads to ambiguity in the assessment of many processes and outcome variables.

This study also illustrates and emphasizes the value and importance of assessing the processes involved in Tech Prep implementation. An exclusive focus on outcomes fails to capture the essence of the interventions that resulted in those outcomes. It is obvious that a major impetus driving the conceptualization of Tech Prep had to do with deficiencies in outcome indicators (school drop out rates, lack of knowledge transfer and application, poor program articulation, etc.). It should also be clear that a major thrust of Tech Prep has to do with developing and implementing processes for restructuring schools and instituting fundamental changes in the way that education is delivered in America. Thus, any valid program assessment model must necessarily include a mechanism for examining "process." As a result of this pilot study, it is recommended that the assessment of the process component include such factors as the quality of integration team interaction; curriculum development and alignment; career path development; advisory council selection, input and interaction; cooperating school agreements; and budgeting. It should also be clear that certain aspects of these process components could also be included in the input component of the model.

It is also important to comment on the nature of Tech Prep structure. Tech Prep is designed to provide broad guidelines within which state and local agencies can work to develop mechanisms that work for them. Tech Prep provides the general structure and the broad guidelines. Local agencies are then free to configure and develop their programs in light of their unique circumstances, needs, goals, and resources. Thus, Tech Prep program implementation inherently tends to be flexible, creative, and localized. This poses unique challenges for program evaluation. Certainly, it is much easier to assess the effects of programs that are homogeneous and for which the boundaries are clearly structured, administered, and maintained. Such is not the case for Tech Prep, nor should it be. Thus, Tech Prep program assessment must consist of a process that uses multiple data collection mechanisms, that includes a diversity of criteria, and that is sensitive to both outcomes and processes as they function within the larger cultural and educational contexts given certain system inputs. The model that is proposed and pilot tested in this study is ideally suited for these purposes.

Given the systemic nature of the Tech Prep initiative, particularly when considered within the larger context of educational reform, it is important that all four of the assessment dimensions be included throughout the planning, implementation, and assessment phases. In order for programs to be assessed systemically and meaningfully, advanced consideration of how context, input, and process components interact and, most important, how (and indeed if) they will be assessed is absolutely critical. An illustration that emerged from this study is that outcomes assessment is, in many cases, impaired by the inability to identify specific input variables (i.e., who is a Tech Prep student).

Thus, while Tech Prep is indeed a concept which is being implemented in many diverse and unique ways, it nevertheless does take on specific programmatic forms at the local level. Tech Prep as "concept" must be translated into Tech Prep as "program." As this occurs, it is critical to subsequent program planning and assessment that the Context, Inputs, Processes and Outcomes which are specific to the local programs be clearly identified and defined. Specific assessment components within each of the four assessment dimensions of the model must be selected for implementation based on the unique characteristics of local consortia. It is perhaps even more important throughout

these developmental stages that the question be raised and addressed, "Can and how will this aspect of the program be assessed?" This approach to Tech Prep assessment will assure that the assessment program is comprehensive and robust enough to detect systemic change and yet that it is specific enough to demonstrate accountability. Such an effort must be directed at establishing baseline data against which subsequent movement can be measured. Given the complexity and variety of Tech Prep programs, it is critical that multiple means be used to conduct program assessment. This is necessary in order to triangulate and interpret data as well as to capture the uniquenesses of various local configurations.

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